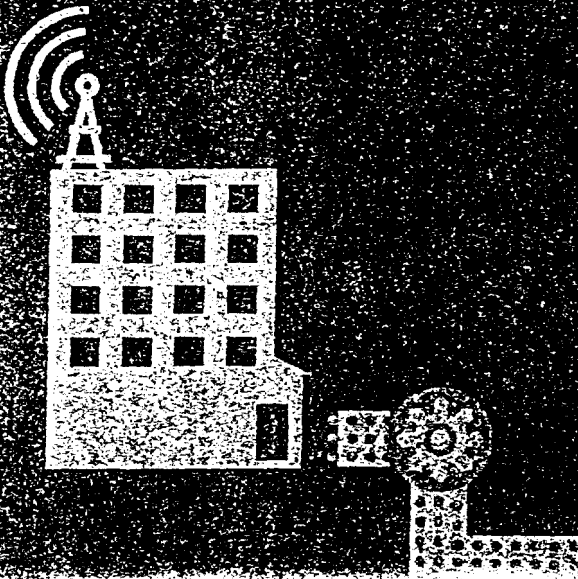


SMART NEW WORLD DIGITAL NETWORKS

A CABLE PROVIDER'S GUIDE TO DEPLOYMENT

CISCO SYSTEMS





CABLE OPERATORS ARE POSITIONED TO WIN IN THE BROADBAND ERA. THE GLOBAL DEPLOYMENT OF DIGITAL, FIBER-RICH CABLE NETWORKS IS TRANSFORMING THE TELECOMMUNICATIONS MARKETPLACE. DIGITAL CABLE IS LEAP-FROGGING OTHER TRANSMISSION MEDIA, AND DIGITAL CABLE OPERATORS ARE PREPARING FOR FAR MORE THAN STATIC BROADCAST AND ON-DEMAND SERVICES. CISCO SOLUTIONS HELP MULTIPLE SYSTEM OPERATORS (MSOs) ACHIEVE LEADERSHIP IN THE BROADBAND ERA—ENABLING NEW INFORMATION, COMMUNICATIONS, AND ENTERTAINMENT SERVICES.

THE COMPETITIVE THREAT IS REAL. GLOBAL DEPLOYMENTS OF DIGITAL SUBSCRIBER LINE (DSL), SATELLITE, AND DATA BROADCAST TECHNOLOGIES ARE ACCELERATING RAPIDLY, PARTICULARLY WITHIN THE NORTH AMERICAN MARKET. THE DAILY ANNOUNCEMENTS FROM NEW MARKET ENTRANTS IS FURTHER EVIDENCE OF THE INCREASING PRESSURE FROM COMPETITORS. ACQUIRING NEW CUSTOMERS AND RETAINING EXISTING ONES HAS BECOME CRITICAL IN THE NEW WORLD. CHOOSING THE RIGHT SOLUTIONS PROVIDER IS CRITICAL FOR SUCCESS.

CISCO OFFERS SUCCESS WITH SCALABLE, STANDARDS-BASED, CARRIER-CLASS SOLUTIONS. ONLY CISCO DELIVERS END-TO-END, SMART, NEW WORLD DIGITAL SOLUTIONS FOR THE CABLE INDUSTRY. THE CISCO OFFERINGS ENABLE THE INDUSTRY'S LEADING HIGH-SPEED DATA SERVICES TODAY, AND CREATE A FOUNDATION FOR THE INFORMATION, COMMUNICATIONS, AND ENTERTAINMENT SERVICES OF TOMORROW.

PROVISIONING THESE SERVICES REQUIRES MODIFICATIONS TO EXISTING CABLE PLANTS. TODAY'S DECISIONS ABOUT NEW NETWORK ARCHITECTURES, HARDWARE, AND SOFTWARE HAVE LONG-LASTING EFFECTS ON TOMORROW'S OPERATIONS AND PROFITABILITY. TO ASSIST CABLE OPERATORS IN ACHIEVING THEIR GOALS, CISCO SOLUTIONS ADDRESS THE KEY STRATEGIC AREAS OF CONCERN TO OPERATORS:

- **REVENUE—INCREASING REVENUES BY OFFERING NEW TYPES OF SERVICES AND BY TARGETING NEW MARKETS**
- **INFRASTRUCTURE—CAPTURING MAXIMUM VALUE FROM THE CURRENT CABLE INFRASTRUCTURE**
- **BRANDING—PACKAGING AND PERSONALIZING CABLE CONTENT TO MAXIMIZE THE PERCEIVED VALUE TO THE CUSTOMER**

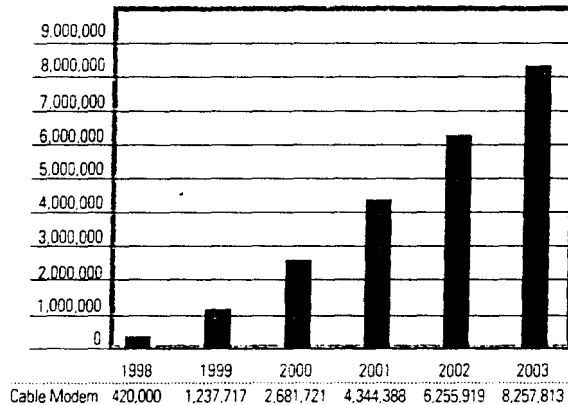
NEW REVENUE OPPORTUNITIES THROUGH NEW SERVICES AND MARKETS

Cable operators have an opportunity today to generate significant revenues from new services in the residential, business, and education markets. The demand for information, entertainment, and communications has exploded, and the cable network presents the single best medium for delivering these services reliably, cost-effectively, and profitably. In fact, analysts predict that the demand for cable modems will grow by almost 10 times in the next few years (Figure 1). Cable operators have the opportunity to take advantage of this tremendous growth by providing advanced services at a fraction of the cost of traditional telco solutions. The range of potential services is limited only by the needs of the customer.

The cable industry is in the midst of a rapid transition from the old-world model based on closed systems providing a single product offering—broadcast television programming—to a New World driven by competition and choice. Cable operators can now offer a multitude of services based on an integrated platform of data, voice, and video capabilities (Figures 1 and 2).

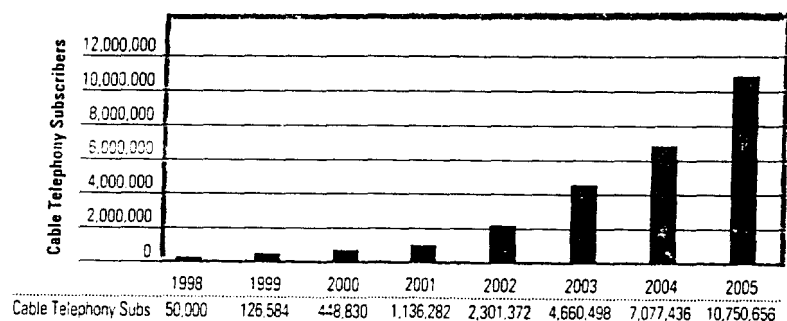
Cisco cable solutions enable operators of all sizes to derive new revenue streams from their existing cable systems and, more importantly, to leap well ahead of other local access providers in terms of service offerings and customer mindshare. Being the first to offer these new services is critical in a local-access market that is expected to become fiercely competitive. The first provider to enter these new markets will acquire customers at a much lower cost than that of the competing access providers that follow.

Figure 1: North America Cable Modem Forecast



Source: The Strategis Group, Inc.

Figure 2: Cable Telephony Forecast



Source: The Strategis Group, Inc.

NEW BROADBAND OPPORTUNITIES IN THE RESIDENTIAL MARKET

Millions of individuals regularly surf the Web from their home computers and new non-PC access products. Customers want new services in addition to Web browsing to make their lives easier and to save them time and money—services that span data, voice, and video.

Data Information

By providing Internet access over two-way cable (Figure 3) or over one-way cable with telco return (Figure 4), cable operators can offer residential subscribers high-speed, multimedia-rich Web surfing and text-based e-mail with multimedia content at a fraction of the cost of today's high-speed telco solutions. And, once in place, this Internet-enabled infrastructure forms the foundation for many more value-added, revenue-generating services.

Voice Communication

Advances in Internet Protocol (IP) technology and reduced regulatory restrictions enable cable operators to tap into the multibillion-dollar telephone market, offering carrier-class quality telephony services over IP to residential subscribers (Figure 5). Even though the capital expenditure is only incremental over that for basic data-only service, this application promises to be one of the most profitable of the New World services that cable operators can offer.

Figure 3: Internet Access over Two-Way Cable

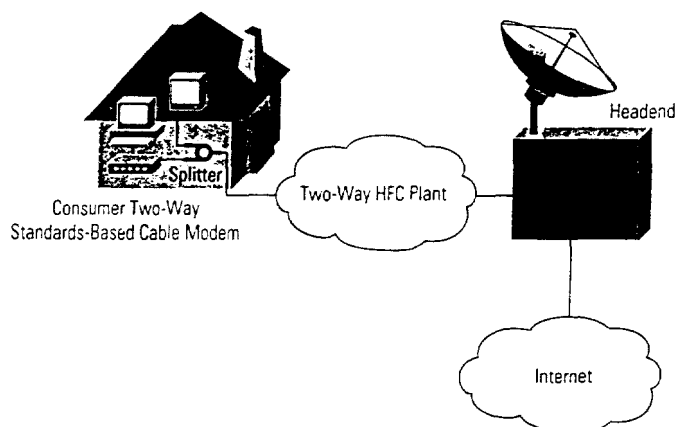
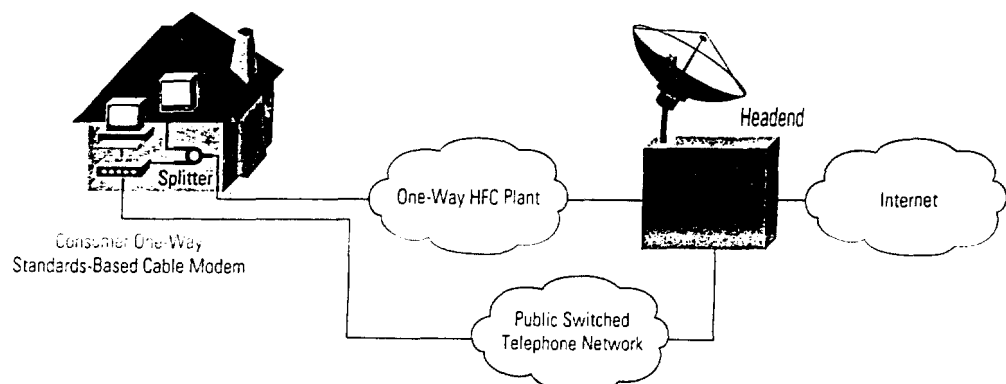


Figure 4: Internet Access over One-Way Cable with Telco Return



IP telephony offers cable operators a number of significant advantages, both when considered as a new service opportunity as well as when compared to traditional circuit-switched telephony over cable. These advantages include:

- Broadening the customer base to attract new cable subscribers
- Increasing revenues from both new and existing subscribers
- Spreading the digital service operating costs and capital investments in plant infrastructure across multiple service offerings, reducing the effective cost of providing each service
- Consolidating technical support and customer service in a unified team, reducing overhead expenses and training requirements while increasing quality of service (QoS)
- Enabling the user to autoprovision and customize service packages, reducing operating costs and enhancing the overall customer experience
- Creating expanded service choices with higher perceived value to subscribers, increasing customer loyalty and reducing churn

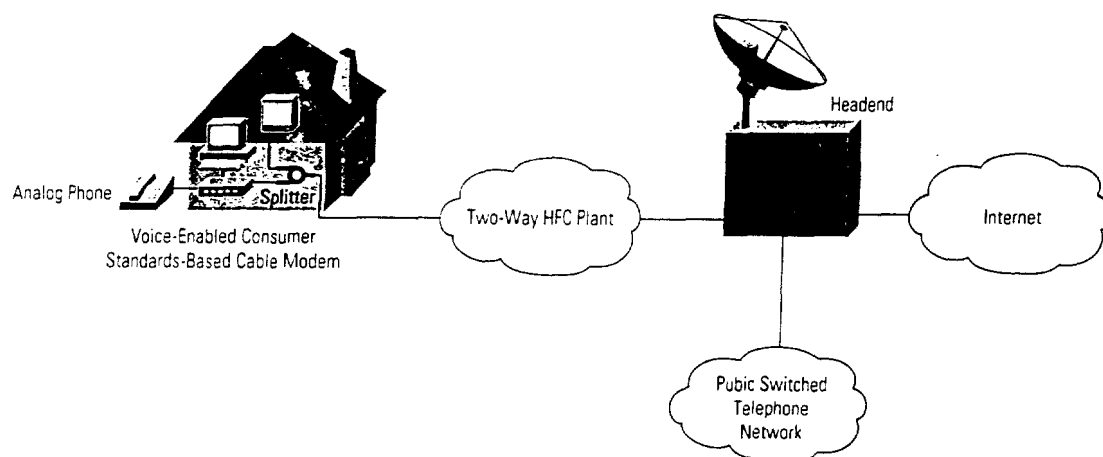
Offering IP telephony service over the existing cable infrastructure reduces the operator's per-subscriber capital and operating costs, increases the utilization and efficiency of the existing bandwidth and physical plant, and enhances the customer's experience and perception of cable service, all at a minimal incremental cost.

Entertainment

New entertainment opportunities for residential subscribers include digital TV, streaming media, television enhanced with synchronized interactive content, multiplayer gaming, local community content, and video on demand (VoD). These services require varying levels of bandwidth for peak performance. Interactive entertainment services differentiate cable companies from competitors such as satellite companies and, when offered with other services, provide the cornerstone of a compelling bundle of integrated services.

Cisco helps the cable industry build out a complete digital entertainment delivery infrastructure. The first step involves putting in place the data network that will support the PCs, set-top boxes, and other devices that will be network enabled. This network must scale to support millions of devices and provide features such as security and QoS that make it a robust platform for a wide variety of services. Once in place, a multitude of interactive services can be deployed on this network, including Web access, multiplayer games, and interactive commerce.

Figure 5: Voice over IP



By adding streaming media capabilities to these networks, a new set of services can be offered. Streaming media, while not being broadcast quality, is easily delivered on-demand to a variety of devices in the home using existing IP networking technologies. Streaming media services include "micro VoD" offerings such as news or sports on demand.

Value-added features can also be added to the traditional video broadcast networks. Targeted ad insertion, customized channel lineups, video on demand, and other features can be enhanced by leveraging both the broadcast video network and the data networks. For example, targeted advertisements can be delivered to the insertion point using IP transport and then inserted into a broadcast video stream.

To allow cable operators to take advantage of these consumer market opportunities, Cisco has established an industry-leading partnership strategy and a complete end-to-end solution.



NEW OPPORTUNITIES IN THE BUSINESS MARKET

For cable operators, offering IP-based data and voice services to the business market is an opportunity to substantially expand their revenue potential and enhance their profit margins. This is because small and medium-sized businesses can benefit not only from high-speed Internet access but also from higher value-added services such as virtual private networking (VPN) connectivity to corporate intranets, telecommuting capabilities for work-at-home employees, and economical public switched telephone network (PSTN) quality voice and fax calls over the managed IP networks.

By leveraging extensive experience and product strength in the small, medium-sized, and enterprise business markets, Cisco is working closely with cable operators to ensure that their entrance into this new, yet lucrative, market is a success.

Teaming up with Cisco by becoming a Cisco Powered Network enables cable operators to leverage business-modeling tools, turnkey solutions, strategic marketing support, and joint marketing campaigns.

Further, Cisco's sales presence with business customers of all sizes can help jump-start a cable operator's move into the business market.

For the business market, Cisco offers best-in-class customer premise equipment (CPE) ranging from the Cisco uBR900 series, featuring an integrated Cisco IOS® router, cable modem, two analog phone ports, and a four-port Ethernet hub to Cisco IP-based digital telephones and private branch exchange (PBX) systems.

Telecommuting

Businesses large and small have employees who work from their homes. To stay in touch, they need secure, high-speed, remote access to the corporate intranet, access to the Internet for e-mail communication with customers and suppliers, and access to a separate telephone and fax line (Figure 6).

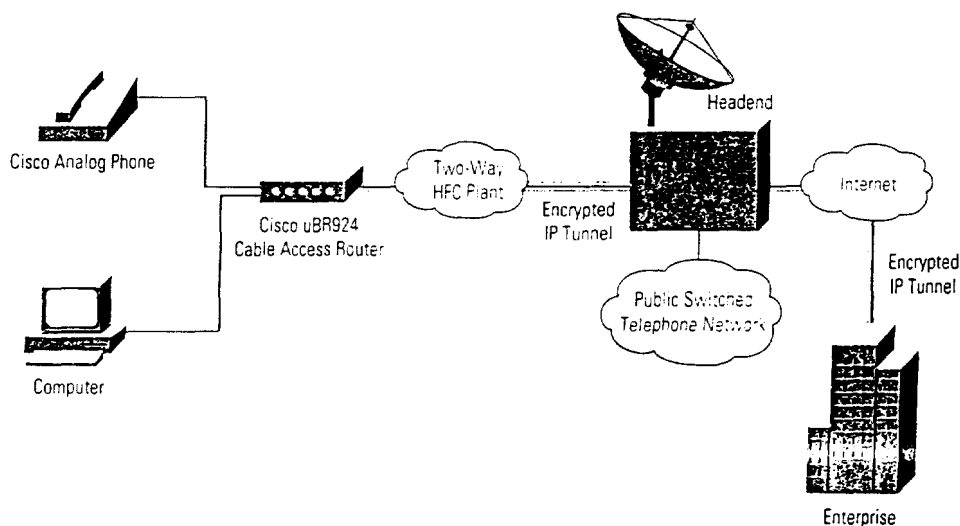
Cable operators can supply reliable, high-speed Internet and intranet access to these telecommuters and many additional services across a single infrastructure. Cable networks can carry two-way videoconferencing for meetings between the telecommuter and other employees, while multicasting transmissions can bring one-way corporate-wide presentations to the telecommuter.

Cable can also deliver voice and fax lines using IP technology. Telecommuters can access their enterprise phone network through a PBX extension across the

broadband link. The benefits for both telecommuters and enterprises are substantial. Enterprises pay reduced company rates for the remote phone calls and get a consolidated bill for all telecommuters. Telecommuters have a transparent office phone and can reach coworkers using fast five-digit dialing.

The Cisco uBR900 series cable access router allows cable operators to meet the needs of even the most sophisticated telecommuter with a highly integrated, standards-based Data Over Cable Service Interface Specification (DOCSIS) device. DOCSIS is the interoperability standard established by a consortium of major North American cable operators. The Cisco uBR900 series' best-in-class integrated router provides added data security for telecommuters while the integrated hub offers the flexibility to add IP telephones, networked printers, or any other IP device as necessary. Running Cisco IOS software ensures reliability and investment protection for the platform.

Figure 6: Telecommuting Services



Branch-Office Communications

Branch offices of large enterprises represent another lucrative market for cable operators. Recent progress in data-over-cable standards and voice and fax over IP technologies make it possible for cable operators to merge the currently separate voice and data networks typically used to connect a branch office to headquarters. Cisco solutions include fully integrated VPN technology for secure transmissions of sensitive corporate data. This allows the replacement of multiple vendors and circuits with a single cable modem connection. Cable operators can deliver cost savings to the enterprise while benefiting from a new and highly profitable revenue stream.

Using Cisco equipment, cable operators can charge on a per-service basis or, through QoS, guarantee levels of bandwidth at incremental rates based on the needs of the branch office. Ninety-nine percent of all corporate intranets in the Fortune 500 are built on Cisco technologies and products. Cable operators can leverage Cisco's enterprise account presence to generate greater awareness of broadband remote-access solutions.

Figure 7. Small-Business Services

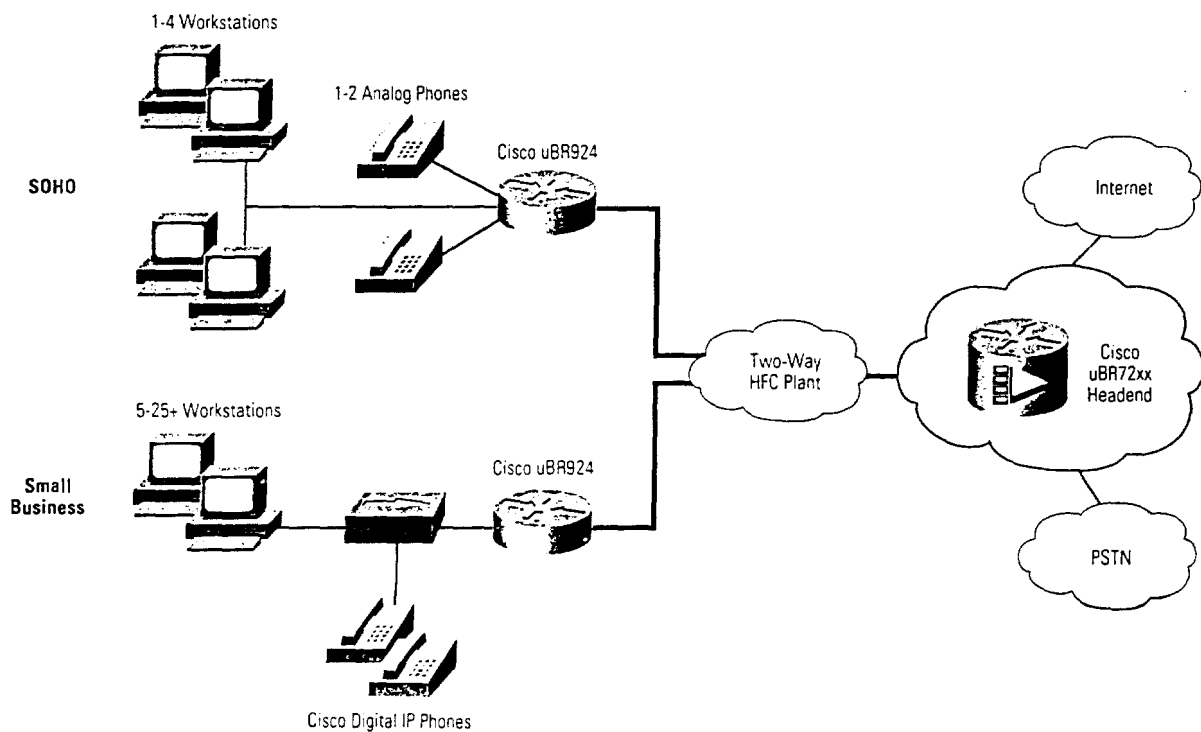
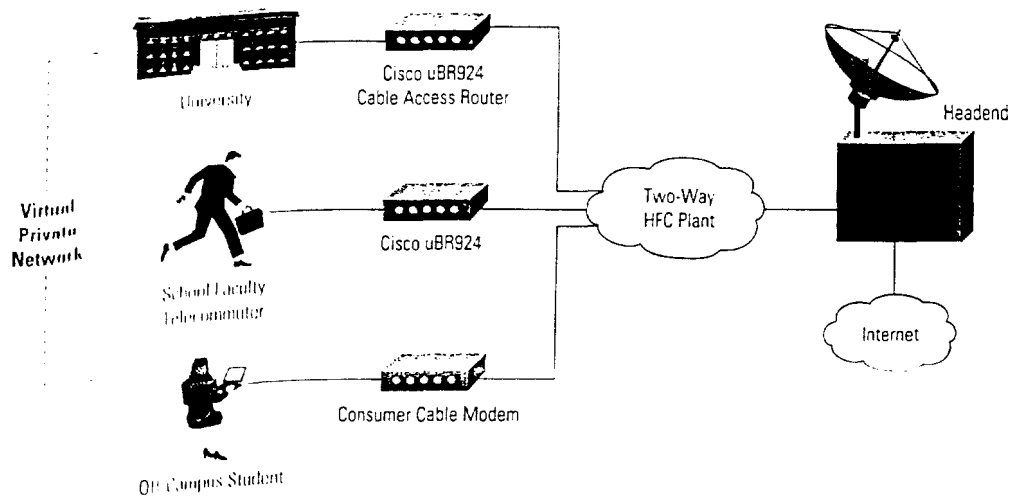


Figure 8 Educational Services



Small and Medium-Sized Business Applications

Although on a lesser scale, small and medium-sized businesses have many of the same information technology needs of the largest enterprises. They require LANs, LAN security, a guaranteed level of Internet access speed (even during peak hours), Web page hosting, e-mail, and voice and fax solutions.

Cable operators can enable small and medium-sized businesses to participate in the New World economy by leveraging broadband-enabled services such as application hosting and supply-chain integration that have been traditionally limited to larger companies.

Cisco solutions give cable operators the power to address these needs (Figure 7). Cisco IP voice technology offers digital phone and voice-mail services over IP while the Cisco uBR924 cable access router provides fully integrated firewall and VPN capabilities. Cisco can also leverage its strong presence with the value-added reseller (VAR) community to help cable operators meet the needs of small and medium-sized businesses at the time they seek their networking and computer solutions from VARs. This simplifies the buying experience for the end user and improves lead generation for the cable operator.

OPPORTUNITIES IN THE PUBLIC SECTOR

High-speed connectivity is not just important for the commercial sector. It is important for the public sector as well. While classrooms are using the Internet for up-to-date information and research, government agencies are using it for distributed data and training.

Universities and Colleges

Cable operators can offer high-speed Internet access in the classroom with sufficient bandwidth to support multiple users. As colleges and universities rely more heavily on Internet technology for enhancing the learning experience, both residence halls and off-campus housing must be broadband-enabled to offer a consistent service to students. Cable operators are uniquely able to offer these ubiquitous data services to students given the high percentage of residences passed.

Education

The World Wide Web is rapidly becoming an integral part of education at the primary and secondary levels as well. Students are accessing educational Web sites, viewing content from educational providers, and communicating with other schools around the world (Figure 8). Broadband access enabled by cable providers will deliver a new level of end-user experience.

By offering high-speed cable access to schools, cable operators can contribute to their community while, at the same time, drive demand for cable services. Students that are used to accessing the Internet at high speeds from school will want to have the same type of connectivity at home. In addition, parents may want to subscribe to this service and view this as an investment in their children's education.

Distance Learning

The cost and availability of teaching professionals has spurred the growth of distance-learning services. Using multicast technology, one professor can teach dozens or hundreds of students in many geographic locations simultaneously. Because industry-leading Cisco IOS software supports multicast transmissions, subscribers can avoid sending multicasts to unauthorized users, saving precious bandwidth.

Government

Government offices at every level are finding it increasingly important to be connected to the Internet, and to each other, in a secure VPN. Government offices have a need to share files and communicate via videoconferencing. The cable infrastructure represents the most cost-effective solution for government offices clustered around a community. Cable operators can thus develop a win-win relationship with their community in several ways, while also expanding their business.

STRATEGIC CONCERNS WHEN DEPLOYING AN INTEGRATED MULTISERVICE NETWORK

The hybrid-fiber-coaxial (HFC) network that cable operators have today is undoubtedly their single most strategic and valuable asset—one that should be maximized. In extracting the optimum value from their plant, operators must ensure that their cable network maximizes both revenue per subscriber and the number of subscribers and minimizes capital expenditures and operating costs. It should also help sustain their competitive edge by enabling cable operators to build a reputation for delivering best-in-class total service quality.

Maximizing Revenue per Subscriber

One way to achieve high revenue per subscriber is by segmenting the market and charging what the market will bear within each market segment. It is not enough, however, for marketing to devise different service offerings. The network must be capable of supporting these offerings through meaningful policing and enforcement mechanisms.

Maximizing the Number of Subscribers

If cable operators build a high-speed network and offer very attractive prices, customer demand will skyrocket. But without the logistical capabilities to automatically provision cable modems into the network, adding new customers will be a slow and tedious process. In order to avoid this pitfall, scalability and advanced autoprovisioning are needed, enabling customers to purchase a modem, plug it in, and subscribe immediately. The system should be sufficiently scalable with adequate capacity to handle large numbers of new users and should be capable of provisioning the new subscriber with as little operator intervention as possible.

Minimizing Capital Expenditures and Operating Costs

The customer-rented cable modem constitutes a large part of today's capital expenditures. To reduce this expense in the near term, operators must be able to buy cable modems at the lowest possible price per unit based on rapid cost reductions as modem vendors ramp up to high-volume production. And in the medium to long term, operators must eliminate the capital expenditures for cable modems from their books entirely.

Cable operators incur large operating costs in three areas: truck rolls, customer support, and cable plant maintenance. The solution should support cable operators in minimizing their costs in these three areas.



Building and Sustaining a Competitive Edge

While maximizing revenue and minimizing costs is a desirable short-term goal, building a reputation for best-in-class service will boost customer retention and accelerate subscriber numbers through referrals from satisfied customers. Best-in-class service requires:

- Performance through a scalable system
- Reliability with minimal service outages ensured by reliable components, flawless execution, and rapid fault resolution
- Security to protect the cable network and cable customer networks against malicious attacks and protect customer data through encryption services, even for multicast data

DEPLOYMENT OF A MULTISERVICE NETWORK

Cable operators can deploy Internet access services in phases to minimize capital outlays and maximize revenue streams. When responding to competition or the need to begin offering some services as quickly as possible, even one-way cable systems can be put to use right away. Cisco cable products provide a unified solution that can be used for telco return today and that helps customers to smoothly migrate to two-way operation as soon as their plant allows it.

Nevertheless, cable operators should never lose sight of the fact that a two-way infrastructure provides the richest service capabilities. Operators should be prepared to move to the next phase quickly to capture these new, full-service customers. In addition, with a small, incremental investment, voice-over-IP (VoIP) technology can be implemented to offer telephony services.

Eventually, a multiservice backbone can be deployed, as shown in Figure 9, to support the largest number of subscribers, each taking a variety of services. Regardless of the size of the cable operator or how they choose to deploy these services, Cisco has the products and expertise to support their network and enable them to enter this New World with the maximum potential.

Cisco has concentrated on building network solutions that address cable operators' strategic concerns with best-in-class provisioning and total service quality for customers.

Figure 9: Integrated Cable Backbone

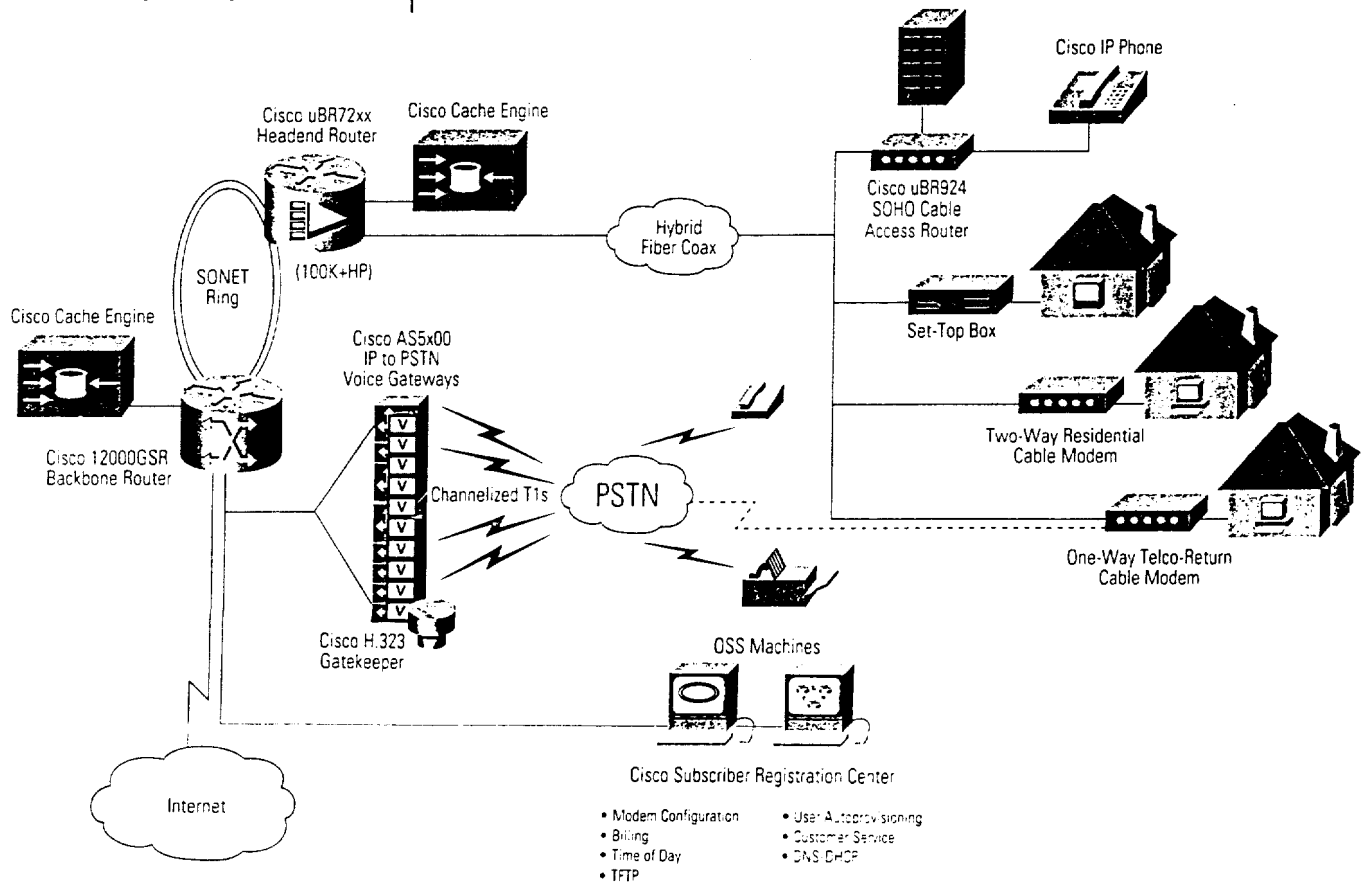
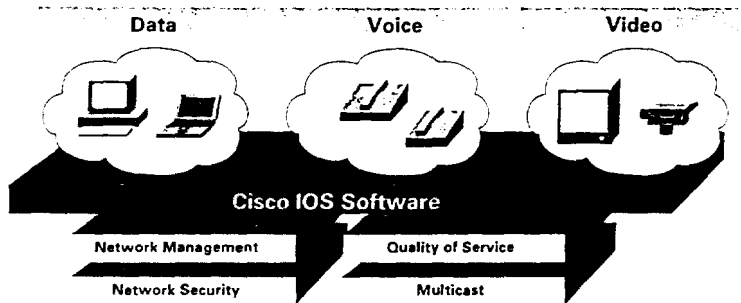


Figure 10: How Service Providers Deliver New Services over Cisco IOS Software



EFFICIENT PROVISIONING OF ADVANCED SERVICES

In deploying a multiservice network, delivering the right services to the right customers is fundamental in order to take advantage of the revenue opportunities outlined earlier. When a customer requests a new service, the operator must be able to deliver that service with minimal delay and interruption to existing services.

In addition to offering superior responsiveness when delivering a new service, the operator must minimize the cost of delivering that service. This includes the reduction or elimination of truck rolls as well as the number of staff hours required to provision the service in the back-office billing system—especially as the demand for service rapidly ramps up. Cisco helps operators address these issues through two key initiatives: integrating Layer 3 intelligence with Cisco IOS software and advanced billing and provisioning.

Integrating Intelligence with Cisco IOS Software

Cisco IOS software powers 80 percent of the Internet. Cisco IOS software allows today's cable operators to seamlessly and efficiently deliver advanced services such as VPN, VoIP, and multicast to their customers.

In addition, the QoS functionality that exists today in Cisco IOS software allows the operators to tailor the service to the needs of their customers. Operators are thus able to take control of what is happening in their network

and provide meaningful restrictions to prevent some subscribers from impairing the service of others who may be paying a premium. This prevents the problems that other systems have today where a few bandwidth hogs can effectively "steal" service from others and cause network performance to suffer.

Because Cisco IOS software is rightly integrated into the Cisco equipment that resides at the headend, as well as in the rest of a Cisco network, delivering new services over Cisco IOS software will appear just as seamless to cable customers (Figure 10). As future revisions to Cisco IOS software become available, the delivery of new revenue-generating services becomes a simple matter of a software upgrade, thereby protecting the operator's system investment.

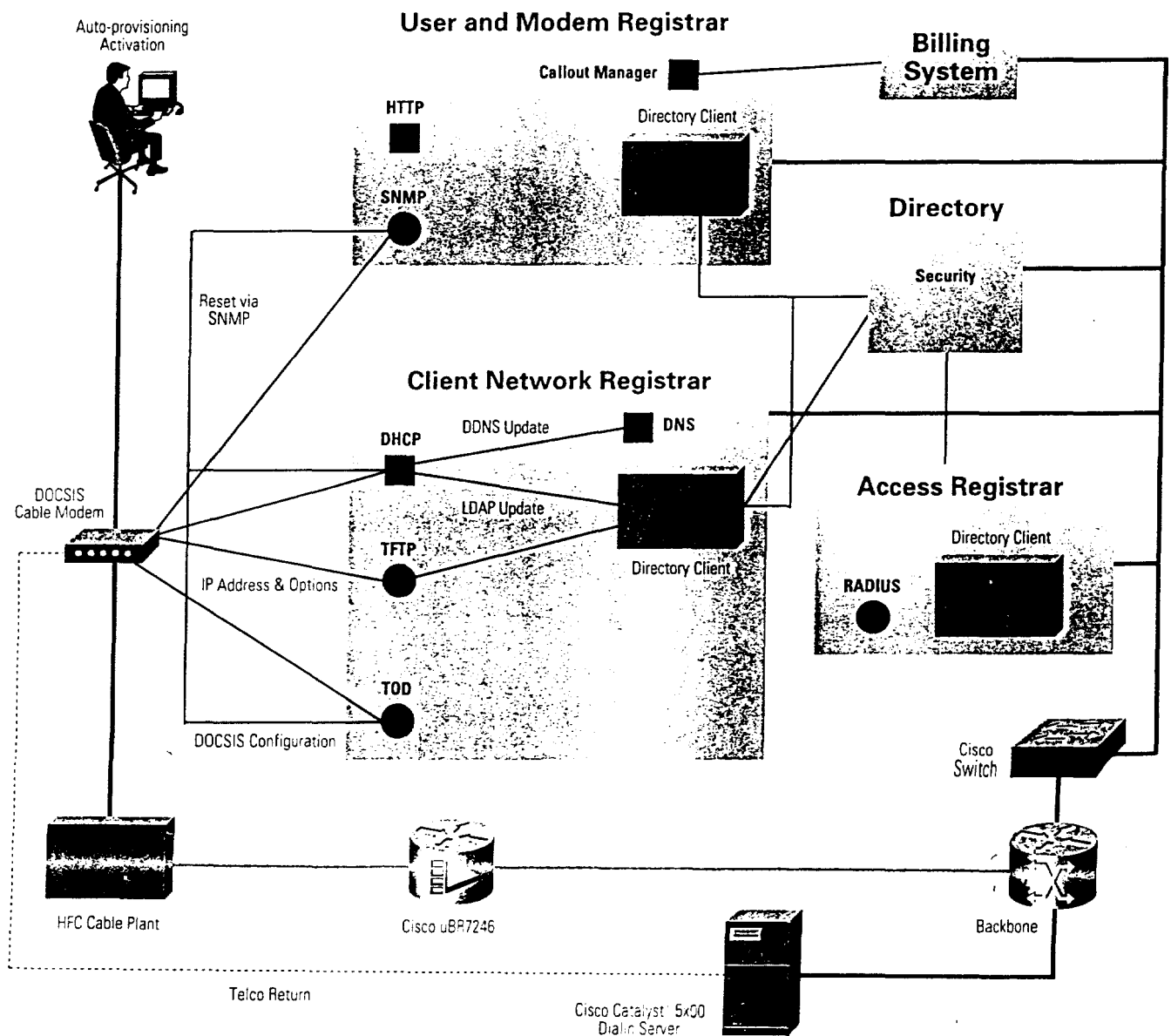
Advanced Billing and Provisioning with Cisco Subscriber Registration Center and NetFlow

While Cisco IOS software lets operators seamlessly integrate new services into their multiservice network, Cisco Subscriber Registration Center (CSRC) and NetFlow products help efficiently monitor and bill for those services. Even in dynamic, nonlinear growth markets, such as the one predicted for broadband services, Cisco software technology lets cable operators easily scale their provisioning and billing to take full advantage of revenue opportunities.

The suite of CSRC products allows service providers to configure and manage broadband modems and enable and administer a subscriber autoregistration process. CSRC includes solutions for user registration (UR), modem registration (MR), DNS and DHCP services (CNR), and access registration (AR) for broadband telco-return. These CSRC provisioning tools help providers manage customer information and the services to which they subscribe.

CSRC ultimately enables customers to autoprovision network services through a simple Web interface. This means that individuals can simply purchase a modem, plug it in, and subscribe immediately without any customer service representative intervention (Figure 11). An installation can be performed without a truck roll, helping cable service providers realize a substantial reduction in customer acquisition costs. In addition, the Cisco solution

Figure 11: Cisco Subscriber Registration Center (CSRC)



is highly scalable and has enough capacity to handle large numbers of new users.

NetFlow is a distributed software tool that allows for real-time monitoring and accounting of data traveling through the HFC plant, including data that never travels beyond the local cable network (Figure 12). By collecting detailed statistics on the quantity and type of data being sent by each customer, cable operators can break through the flat pricing model and bill for the true value of services used. To transform NetFlow's powerful data-gathering capabilities into a complete billing system, Cisco is teaming up with leading billing software companies around the globe. Additionally, cable operators have the opportunity to build their own customized billing applications using NetFlow.

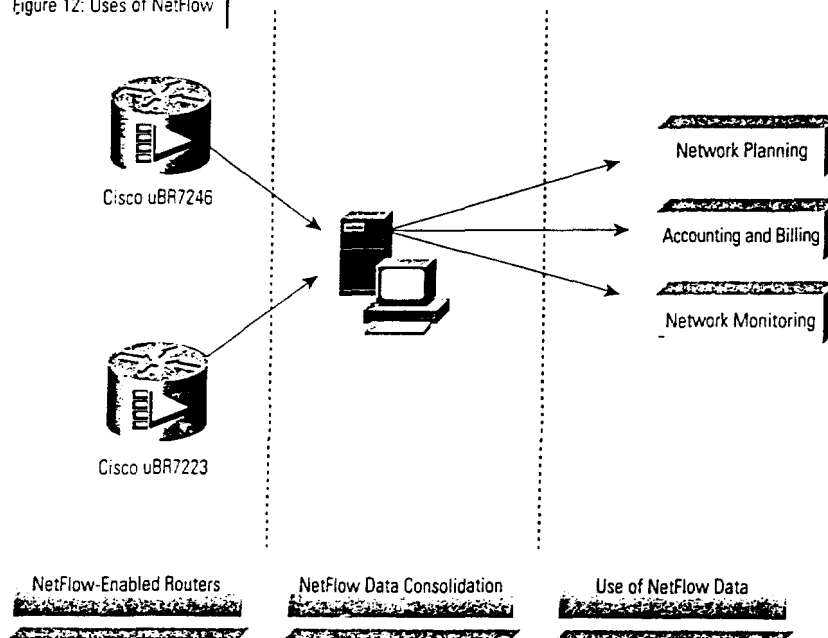
The significance of CSRC and NetFlow goes far beyond cost savings. CSRC and NetFlow help cable operators escape the present logistical limitations of other systems. Adding new customers can become a quick,

automated process. This is especially important when wide availability and low prices lead to skyrocketing customer demand. It truly enables the retail model of distribution that can help operators entirely eliminate the capital expenditures for cable modems from their books.

This Cisco autoprovisioning solutions also allows subscribers to instantly and effortlessly change the parameters of their service offerings. With changes taking effect immediately, subscribers are more likely to make an impulse buy of additional services.

Automating routine provisioning tasks reduces call-center support costs and frees customer advocates to focus on more critical customer needs. Overall customer experiences will be improved, raising overall customer satisfaction and retention rates.

Figure 12: Uses of NetFlow



PROVIDING BEST-IN-CLASS SERVICE QUALITY

Customers do not care why their networks or telephone connections went down—they care only that they are down. For cable operators to remain competitive, they must provide highly-reliable, highly-available services equivalent to what customers expect from their telephone company.

Figure 13 illustrates the chain of equipment that must function flawlessly to provide the cable customer with quality service. Equipment, by its very nature, will break down. But a cable system should meet the following minimum requirements:

- Equipment that rarely fails
- Alarms that enable the operator to take action should equipment be on the verge of failing
- Easy-to-locate points of failure
- Easy-to-fix equipment to prevent or minimize disruption to the system

In addition, the system should be safe from human failure factors, such as hacker attacks or customer errors, so that customers feel that their data is secure.

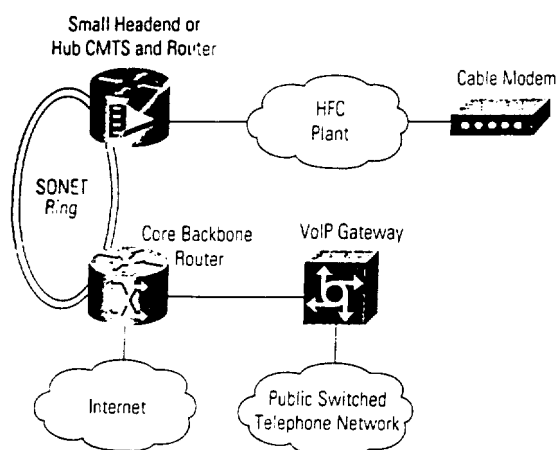
High Availability and Reliability in the Data Network

A reliable service is built from reliable equipment. Cisco offerings have enhanced hardware and software fail-safe reliability features with very high meantime between failure (MTBF) specifications. Software crashes may often be the most frequent cause of system failures, especially for systems with large quantities of untested and unproven code. Cisco products run on highly stable, time-proven Cisco IOS software, which is used by every level of Cisco products—all the way to the high-end Cisco routers that form the heart of the Internet.

Cisco dependability also extends to the hardware. Redundant power supplies as well as time-proven and stable hardware designs contribute to this stability, with field-replaceable, hot-swap capabilities for all cards, processors, and other components of the system.

Tying hardware and software together into a very high-availability system is the Hot Standby Routing Protocol (HSRP). Cisco is continually working on still higher standards of reliability and availability that will help cable operators move even further into New World telecommunications.

Figure 13: Different Points of Failure within the Network



HFC Plant and Digital Network Diagnostics and Troubleshooting

The HFC plant is the core advantage that cable operators have to enable these New World services and their associated revenue opportunities. The digital network portion of the system will also be important from the outset. Knowing what is happening within the network at all times is essential to generating maximum revenue.

The shared nature of the cable plant means that potential problems in one area of the network can impact major portions of the network. The Cisco uBR7200 family of headend products enables dynamic monitoring of the network by isolating problems in both the radio frequency (RF) plant and the backbone network early on. This allows operators to proactively correct problems with little or no service disruption. This is achieved by using every DOCSIS-based modem on the network as a state-monitoring device. The net effect is like having thousands of scouts in the network continuously monitoring for any possible source of trouble.

Should equipment problems occur, they can be dealt with quickly. All Cisco equipment components are hot-swappable and field-replaceable. Strategically located parts depots ensure timely delivery of components when needed.

Advanced spectrum management capabilities in the Cisco uBR7200 family ensure that upstream traffic is carried over the cleanest possible channel, while minimizing disruption due to frequency hopping. This enables cable operators to maintain reliable service to end users as ingress noise changes during the course of the day. It also helps provide graceful degradation when network problems do occur, so that some level of service can be provided until problems are resolved.

Cisco equipment can all be remotely monitored in detail—down to environmental factors such as temperature and humidity—even when it is in an unstaffed location. With today's labor costs, the ability to control everything at a distance is very important. This control can allow operators to swiftly deal with many potential problems from a remote terminal or enable the system to offer graceful degradation so that it can continue functioning while a repair crew is dispatched to correct the problem.

Often, operators can learn of impending problems very early on and can troubleshoot and proactively correct the cause of the problem well before customer service is disrupted. Operators can therefore realize substantial savings in call-center support and valuable repair technician's time while providing much higher customer satisfaction levels.



Security

Integrating carrier-class routing into a cost-effective cable modem termination system (CMTS) provides significant advantages over two separate boxes linked together. In addition to the QoS mentioned earlier, integrated Layer 3 intelligence also enables enhanced levels of security.

Cisco IOS software protects against attacks by hackers and other security issues by offering true Layer 3 functionality. The Cisco uBR72xx also supports encrypted multicast with entrance authentication so that the operator can offer secure multicast support such as video streaming, which can substantially increase revenue.

Cisco Support Programs

Cisco offers support services that maximize the returns on investments in Cisco technology. The Cisco team can contribute to success during the complete network life cycle: planning, design, implementation, and operation. All of the Cisco support solutions help MSOs leverage their in-house support staff while augmenting their skills, experience, and resources with those of Cisco technical experts.

Cisco customer advocacy support solutions offer extensive flexibility. Operators can choose from standard service packages or customized solutions tailored for unique environments. When cable operators take advantage of Cisco support solutions, they are assured of a rapid deployment, high availability, and long life for the site.

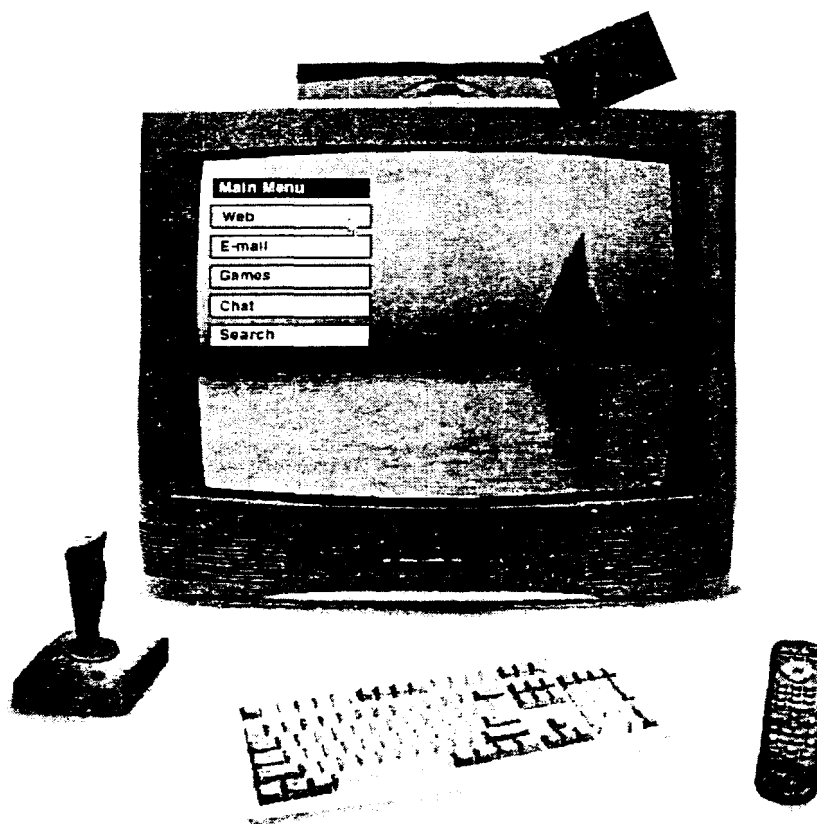
TO FIND OUT MORE ABOUT CISCO
CABLE PRODUCTS AND SOLUTIONS,
VISIT WWW.CISCO.COM/CABLE.

Cisco Digital Set-Top Infrastructure Solutions

End-to-End Digital Entertainment Solutions for Today's Sophisticated Consumers

In the past few years, Cisco Systems has helped drive a rapid and exciting revolution in the cable industry. Since introducing the industry's first standards-based cable modem termination system (CMTS) in 1998, Cisco, working with its New World Ecosystem partners, has pioneered an impressive range of interactive cable networking and digital set-top solutions. In the first in a series of Broadband Entertainment Solutions, Cisco is pleased to introduce its first end-to-end digital set-top infrastructure solution that supports all major standards. With Cisco's Digital Set-Top Infrastructure Solutions, cable service providers can deliver a new generation of interactive data and video services to new markets of enthusiastic customers. (Refer to Figure 1.) Now cable service providers can rely on Cisco, the Internet networking leader, for the complete end-to-end, digital set-top infrastructure solutions they need to expand their services, diversify their revenue streams, and become more competitive and successful.

Figure 1 Cisco's new Digital Set-Top Infrastructure Solutions give your customers new interactive digital services like web surfing, e-mail, video gaming, and e-commerce from the convenience of their television.



Public
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Digital Set-Top Infrastructure Solutions: End-to-End. Open. Standards-based.

Cisco's set-top infrastructure solutions are the first to support all major cable industry standards including:

- The OpenCable™ Initiative
- DOCSIS
- EuroDOCSIS
- DVB-RC
- DAVIC
- DVS-167

As such, Cisco's set-top infrastructure components offer cable service providers the freedom to choose the equipment that best supports their particular customer applications. Whether it is a low bandwidth application such as electronic program guide (EPG) or conditional access (CA), or a high bandwidth application such as web surfing or streaming media—Cisco's Digital Set-Top Infrastructure Solutions offer the range of standards you need to support the services your customers require.

Set-Top Infrastructure Overview

Building on the existing equipment within the cable network, Cisco's Digital Set-Top Infrastructure Solutions components enable the delivery of interactive program content to subscriber homes. Cisco, together with its Ecosystem partners, provides equipment for the high-speed fiber backbone, headend, hub, data center, and home. (Refer to Figure 2.)

Key Components of Cisco's Digital Set-Top Infrastructure Solutions

Set-Top Box

The digital set-top box, provided by a number of Cisco's Ecosystem partners, plays a key role in the delivery and display of interactive TV program content. Its primary function is to deliver video and interactive services to the subscriber's TV screen. Through the set-top box, an impressive breadth of compelling data and video applications can come together to form a seamless, interactive whole. Like all components of Cisco's Digital Set-Top Infrastructure Solutions, the digital set-top box integrates with Cisco's solution through open standards.

Cisco uBR7246-VXR

The Cisco uBR7246-VXR universal broadband router (uBR) combines the functionality of the industry-leading Cisco 7200 series router and a headend CMTS in one integrated, cost-effective, and scalable platform. Designed for large-scale deployments, the DOCSIS-based Cisco uBR7246-VXR combines high backplane capacity, carrier-class reliability, and the proven capabilities of the Cisco 7246 platform. It also supports IP routing with a wide variety of protocols.

Cisco INA2320

The Cisco INA2320 Interactive Network Adapter (INA) offers cable service providers support for digital set-top boxes and DVB cable modems in a single, integrated platform. It routes data over the OOB DVB-RC/DAVIC/DVS-167 channel, and can be used alone in the OpenCable Basic set-top architecture or in conjunction with the uBR7246-VXR in an OpenCable Advanced set-top box architecture.

Cisco 6920 RateMux

The Cisco 6920 RateMux allows cable service providers to manipulate digital video programming and tailor it to the needs of their local markets. With the Cisco 6920 RateMux, cable service providers can pick and choose programs from multiple MPEG streams and rebundle them into a single stream, thereby reducing channel bandwidth usage; easily add or drop channels; insert local content, such as advertising, which can target specific regions or demographic criteria; and dynamically adjust bit rates to meet the capacity of the local network.

Cisco Subscriber Registration Center

The Cisco Subscriber Registration Center (CSRC) automates subscriber self-registration and provisioning, enabling cable service providers to deliver interactive services to customers as efficiently and cost-effectively as possible. With CSRC, you can add subscribers at an exponential rate. In the past, this growth would have been impossible because of the number of truck rolls and technician hours required. Now with user self-provisioning capabilities from Cisco, cable service providers can quickly add new subscribers and services to accelerate the creation of new revenue streams.

Cisco ONS 15454

The Cisco ONS 15454 router offers cable service providers a solution for transporting integrated data, voice, and video over the same fiber backbone. Multi-service transport allows for more efficient use of network bandwidth. Cable service providers also benefit from operational efficiencies gained from maintaining one integrated network versus multiple networks.

Cable and Wireless Successfully Deploy Digital Interactive Television

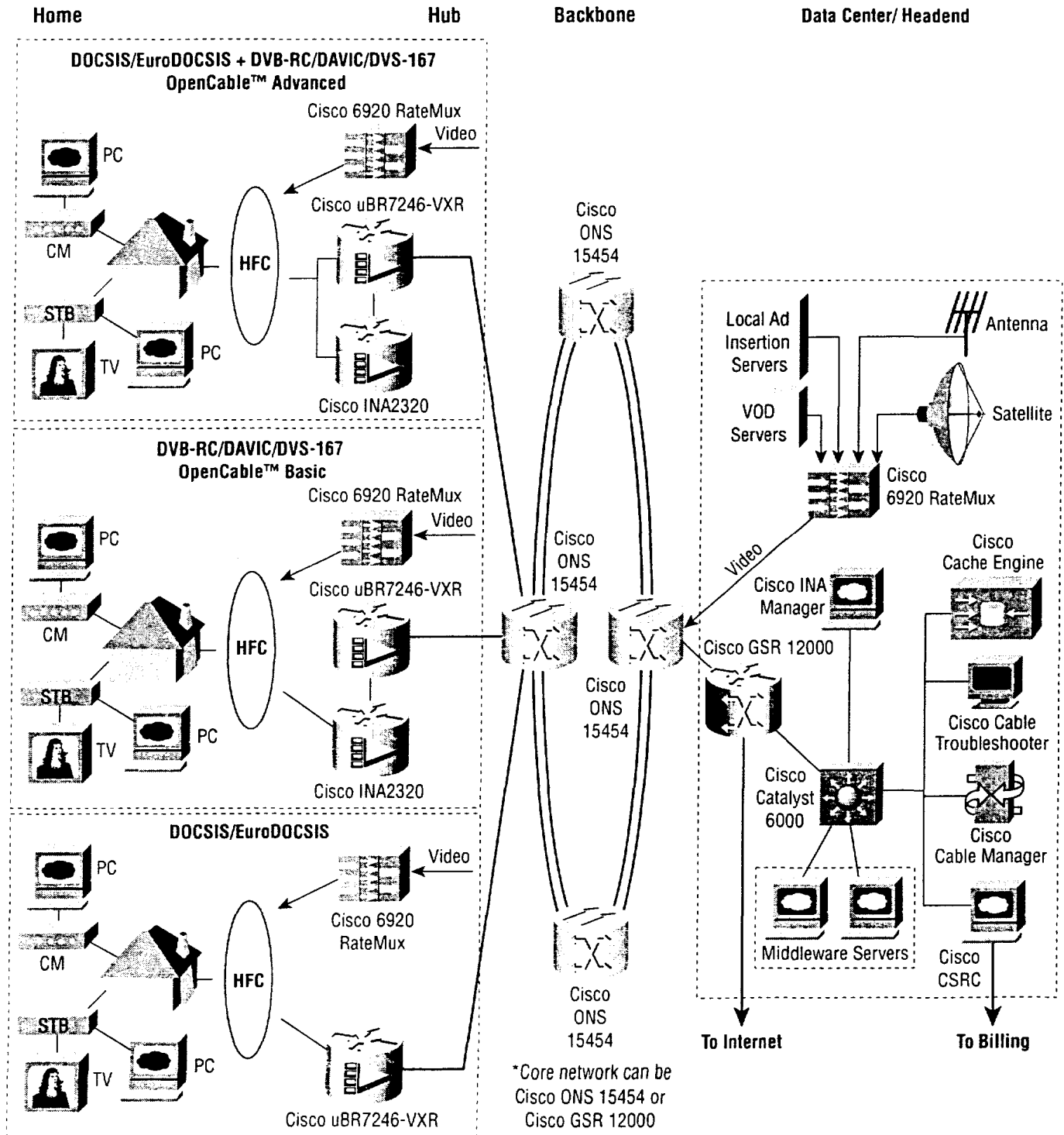
Cable and Wireless Communications, U.K.'s leading supplier of integrated communications, wanted to leverage its two-way cable infrastructure to deliver more services to customers, especially interactive services for entertainment, information, electronic commerce and personal finance. Although the company considered deploying a single-vendor proprietary solution, Cable and Wireless instead chose the open standard solution offered by Cisco and its New World Ecosystem partners.

"Working with world-class partners has enabled us to be first to market with broadcast and interactive television services," said Noel Leslie, Director of TV at Cable and Wireless. "And we are already seeing spectacular results: 10,000 customers in the first four weeks of rollout suggest that customers are enthused about this revolution in broadcasting."

Specific products and technologies deployed include the Cisco uBR7246 CMTS, the Cisco GSR 12000 gigabit switch router, the Cisco Network Registrar, the Pace DiTV-1000 set-top box, and middleware from Liberate Technologies. This solution integrates video and interactive data technologies for services such as digital cable television, tailored web browsing, and e-mail. Cable and Wireless and its customers are now realizing the promise of multiple integrated innovative services over a two-way cable infrastructure.

Figure 2 With support for all major standards, Cisco and its Ecosystem partners create end-to-end solutions to deliver interactive program content to subscriber homes.

Digital Set-Top Infrastructure Solutions



A Host of Benefits for Cable Service Providers

As the first and only digital set-top infrastructure solution that supports all major industry standards, Cisco Digital Set-Top Infrastructure components integrate to deliver cable service providers a variety of important benefits.

- **End-to-End Solution.** Cisco's comprehensive set-top infrastructure components are designed to provide a complete solution, from your network backbone to your data center to the headend to the home set-top box. These pre-integrated components, together with Cisco IOS® software, provide end-to-end system-wide connectivity while accelerating system installation and deployment.
- **One Network for All Your Services.** Cisco Digital Set-Top Infrastructure Solutions lower operational costs by leveraging the same standards-based network infrastructure used to deploy a host of interactive services.
- **Generate New Revenue.** Cisco's Digital Set-Top Infrastructure Solutions enable cable service providers to differentiate their offerings from other service providers and to increase their revenue potential with a spectrum of new high-margin services.
- **Ensure Customer Loyalty.** Taking advantage of these solutions offers your customers more service options and newer more engaging programming, which will help ensure customer loyalty and retention in an increasingly competitive market.
- **Scalability.** The exceptional scalability of Cisco Digital Set-Top Infrastructure Solutions enables the same broadband infrastructure to accommodate both standard traffic volumes and high traffic volumes associated with peak demand periods. Cisco's hallmark scalability also makes it easy for cable service providers to add increasing numbers of users without expanding their basic network configuration.
- **Reliability.** Cisco Digital Set-Top Infrastructure Solutions are powered by the same Cisco IOS that runs mission-critical applications on most of the world's networks. Because our solutions are pre-tested and pre-integrated, you can rest assured that they will work as expected.
- **Interoperable Solutions.** Cisco's support for multiple open standards ensures interoperability of equipment from various vendors—now and in the future. This feature also allows you to easily incorporate emerging technology into your existing standards-based network.
- **Expand Your Services.** Cisco's open, standards-based set-top infrastructure components unlock the full potential of your hybrid fiber coaxial (HFC) cable plant, enabling you to deliver all services to all devices. Using this comprehensive solution, cable service providers can now merge Internet data and video to offer exciting new services such as web surfing, enhanced TV, targeted advertising, electronic commerce, chat, and interactive games.

Cisco Offers Significant Advantages

In addition to leading the industry in support for open standards, Cisco also offers cable service providers real-world experience. We have already delivered our Digital Set-Top Infrastructure Solutions to multiple cable service providers. Cisco's solutions are the most widely deployed data-over-cable technology in the industry. This experience has helped Cisco continue to develop the most innovative, reliable, and cost-effective solutions for today's cable service providers.

- **All Services. All Devices. One Network.** Cisco Digital Set-Top Infrastructure Solutions allow you to build a single network infrastructure that will deploy data, voice, and video services to residential and commercial customers. The result is a cost-effective solution for meeting rapidly growing consumer demand for interactive entertainment and other services, both now and in the future. Cisco envisions cable as a primary medium for the delivery of all services, including voice, streaming video, video on demand, and interactive video gaming that will all seamlessly work together on one network. The advantages of using Cisco's end-to-end Digital Set-Top Infrastructure Solutions to deliver these services include:
 - **Flexibility.** Cisco's standards-based, end-to-end digital set-top infrastructure allows you to meet the growing consumer demand for enhanced services flexibly and easily.
 - **Cost-effective Deployment.** Cisco solutions also leverage your existing standards-based backbone, headend, and hub system infrastructure to lower your cost of ownership.
 - **Ease of Deployment and Maintenance.** Using a pre-tested and pre-integrated end-to-end digital set-top infrastructure simplifies system deployment and maintenance.
 - **Greater Revenue Growth.** Using the same network infrastructure to deploy multiple services enables you to grow your revenue with ease. With Cisco's Digital Set-Top Infrastructure Solutions, you don't have to build a new network for each new service. You can simply extend your current infrastructure to expand your services and dramatically increase your revenues.
 - **Increased Competitiveness.** Competitive services from non-cable sources have helped create strong demand for interactive entertainment services. Cisco's end-to-end Digital Set-Top Infrastructure Solutions enable cable service providers to meet existing and future demand more affordably than other technologies, increasing their competitiveness in the entertainment services market.

The Value of Open Standards Support

Cisco leads the industry in supporting all major open industry standards. Why is this so important? Standards make it possible for disparate equipment from various vendors to come together to form a complete, cohesive system. By ensuring that new interactive cable equipment will be interoperable and compatible with existing equipment, open standards eliminate the risk to cable service providers of ending up with an expensive, proprietary, dead-end system.

Support for multiple standards offers cable service providers the freedom to select the most appropriate standards-based equipment for a particular application, which helps reduce deployment costs. This advantage enables them, in turn, to provide their subscribers with the widest array of services possible. For these reasons, we intend to continue to support all major standards to ensure that our customers have the broadest range of choices in the industry.

- **Commitment to Industry Standards.** At Cisco, support for industry standards is more than just a design strategy, it's a corporate mission. Because of our leadership in pioneering and supporting open standards, you can choose the standards-based infrastructure solution that best meets your requirements.
- **Networking Expertise.** Cisco has built a reputation as the worldwide leader in networking for the Internet. In fact, the vast majority of all Internet routers—the devices that channel data to the right network location—come from Cisco. The ability to leverage this experience and expertise makes Cisco your ideal partner in rolling out your digital set-top infrastructure solutions.
- **Broadband Leadership.** Cisco has extended its Internet leadership to all broadband access technologies. In the cable industry, Cisco's leading Internet technology makes it possible for cable service providers to deliver both advanced interactive services and video reliably over the same network.
- **Committed to Innovation.** A pioneer in interactive cable services, Cisco is pleased to say that we helped drive the industry's development with innovations like the industry's first DOCSIS-qualified CMTS. Because of our commitment to innovation and technical leadership, you can be certain that Cisco will continue to offer the most reliable, feature-rich, high-performance solutions in all segments of the interactive cable market.
- **World-Class Customer Support.** Cisco's world-class service and support solutions enhance the value of your investment in network infrastructure, reducing your overall cost of doing business. Backed by Cisco's unmatched intellectual capital, technical expertise, and support resources, you can now deliver fully on the promise of internetworking technology and industry-leading entertainment solutions.
- **Your Partner in Success.** Cisco considers itself more than just your solutions provider; we're also your business partner. That's why we place such heavy emphasis on service and support. Cisco is committed to working with our customer partners to ensure their end-to-end Digital Set-Top Infrastructure Solutions meet their business requirements now and as their needs evolve. In short, Cisco considers itself successful only when you're successful. That's what we mean by partner.

For more information about Cisco's end-to-end Digital Set-Top Infrastructure Solutions visit our web site at www.cisco.com/cable.



Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems Europe
11, Rue Camille Desmoulins
92782 Issy Les Moulineaux
Cedex 9
France
<http://www-europe.cisco.com>
Tel: 33 1 58 04 60 00
Fax: 33 1 58 04 61 00

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-7660
Fax: 408 527-0883

Asia Headquarters
Nihon Cisco Systems K.K.
Fuji Building, 9th Floor
3-2-3 Marunouchi
Chiyoda-ku, Tokyo 100
Japan
<http://www.cisco.com>
Tel: 81 3 5219 6250
Fax: 81 3 5219 6001

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